WHAT IS CLAIMED IS:

1. An engine control system comprising:

an ion current measuring unit adapted to measure a negative ion current in a combustion chamber of an engine;

a crank-angle measuring unit adapted to measure an engine crank angle; and

a controller adapted to control the engine on the basis of a first crank angle at which an increase rate of the negative ion current relative to the crank angle becomes more than a first specified value and a second crank angle at which the increase rate becomes a second specified value after becoming the first specified value.

2. The engine control system according to Claim 1, wherein

the first crank angle is a crank angle corresponding to a rising point of the negative ion current on a negative ion current curve indicative of variations in negative ion current relative to crank angles; and

the second crank angle is a crank angle corresponding to a peak point of the negative ion current on the negative ion current curve.

3. The engine control system according to Claim 2, wherein the controller is adapted to calculate from the first crank angle and the second crank angle a third crank angle corresponding to a fuel center of gravity and the controller is adapted to control the an engine ignition timing so that the third crank angle approximates a specified target crank angle.

4. The engine control system according to Claim 3, wherein the specified target crank angle is not changed according to engine load conditions.

5. The engine control system according to Claim 3, wherein the specified crank angle corresponds to MBT.

6. The engine control system according to Claim 3, wherein the specified target crank angle is set to a predetermined crank angle delayed behind MBT.

7. The engine control system according to Claim 2, wherein the controller is adapted to calculate a variation rate of the third crank angle corresponding to the fuel center of gravity from the first crank angle and the second crank angle, and the controller is adapted to controls an exhaust gas recirculation (EGR) rate of the engine so that the EGR rate decreases when the variation rate increases.

8. The engine control system according to Claim 2, wherein the controller is adapted to calculate a variation rate of the third crank angle corresponding to the fuel center of gravity from the first crank angle and the second crank angle, and the controller is adapted to control an open-close timing of an intake valve and an exhaust valve of the engine so that the overlap period of the intake valve and the exhaust valve decreases as the variation rate increases.

9. The engine control system according to Claim 1 in combination with a vehicle.

10. A method for calculating a fuel center of gravity of an engine, the method comprising:

measuring a negative ion current in a combustion chamber of the engine;

determining a first crank angle at which an increase rate of the negative ion current relative to an engine crank angle exceeds a first specified value;

determining a second crank angle at which the increase rate becomes a second specified angle after exceeding the first specified value; and

calculating the fuel center of gravity from the first crank angle and the second crank angle.

11. A method for controlling the operation of an engine, the method comprising:

measuring a negative ion current in a combustion chamber of the engine;

determining a first crank angle at which an increase rate of the negative ion current relative to an engine crank angle exceeds a first specified value;

determining a second crank angle at which the increase rate becomes a second specified angle after exceeding the first specified value; and

controlling the engine on the basis of the first crank angle and the second crank angle.

12. The method for controlling the operation of an engine according to Claim 11, wherein

the step of controlling the engine comprises:

calculating a third crank angle corresponding to the fuel center of gravity from the first crank angle and the second crank angle; and

controlling engine ignition timing so that the third crank angle approximates a specified target crank angle.